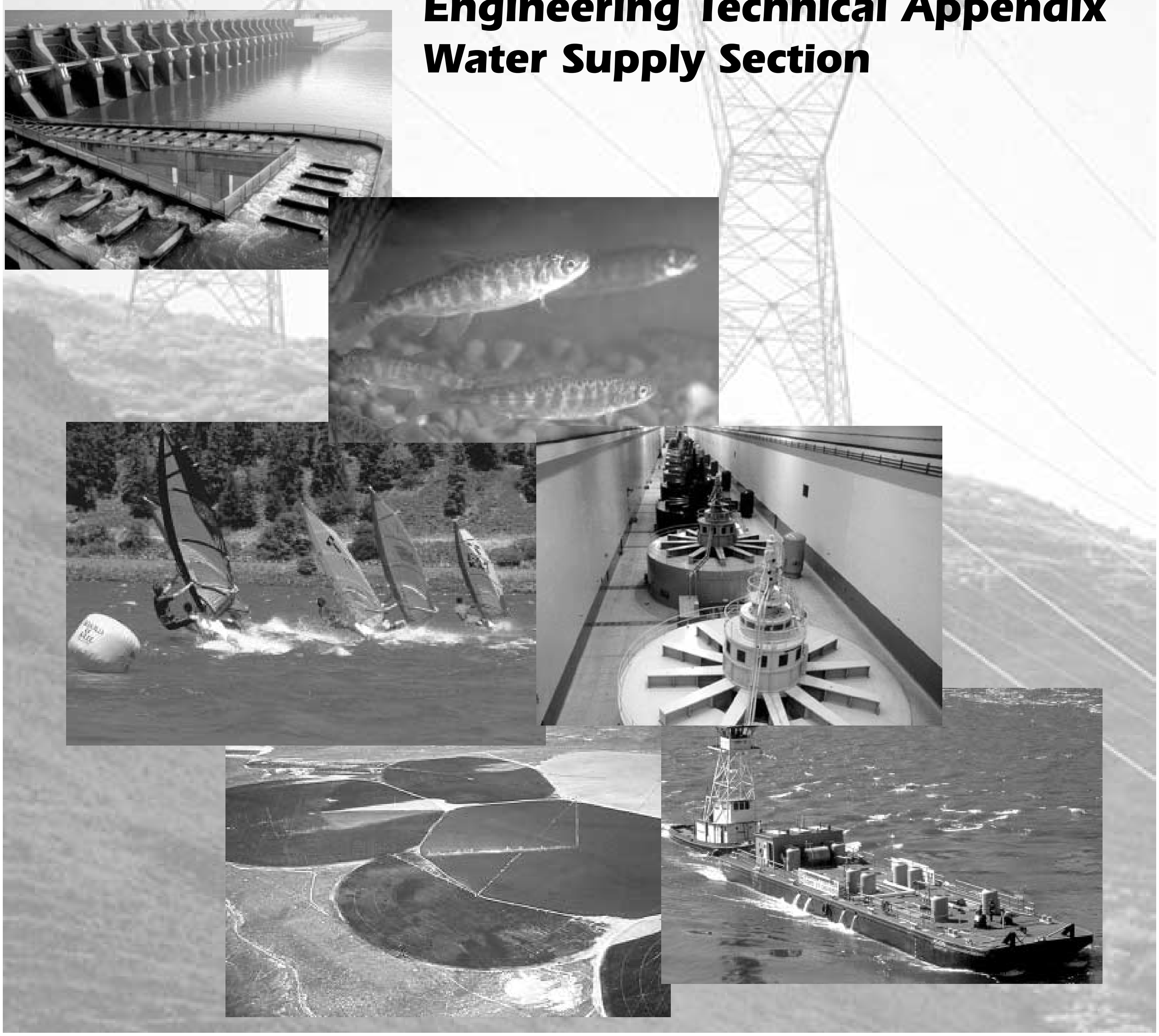
US Army Corps of Engineers®
Portland District

Salmon Recovery through John Day Reservoir

John Day Drawdown Phase I Study

Engineering Technical Appendix Water Supply Section



September 2000

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Section 1. Introduction

This technical appendix documents the results of the water supply evaluation for the John Day Drawdown Phase I Study. This Phase I Study is a reconnaissance-level evaluation of the potential consequences and benefits of the proposed drawdown of the John Day Reservoir. This technical appendix supplements the main report, which describes more fully the alternatives, purpose, scope, objectives, assumptions, and constraints of the study.

Section 2. Background of the Project

In 1991, the National Marine Fisheries Service (NMFS) proposed that Snake River wild sockeye, spring/summer chinook, and fall chinook salmon be granted “endangered” or “threatened” status under provisions of the Endangered Species Act. Natural resource agencies believe that the drawdown of the 76-mile John Day Reservoir may provide substantial improvements in migration and rearing conditions for juveniles by increasing river velocity, reducing water temperature and dissolved gas, and restoring riverine habitat. It is also speculated that drawdown may improve spawning conditions for adult fall chinook by restoring spawning habitat and the natural flow regimes needed for successful incubation and emergence.

As a result, the NMFS Reasonable and Prudent Alternative Action #5 of its’ Biological Opinion on Operation of the Federal Columbia River Power System (FCRPS), and subsequent reports recommended that USACE investigate the feasibility of lowering John Day Reservoir. In compliance with appropriation conditions, only two alternatives were to be evaluated: reduction of the current water surface elevation 265 to the level of the spillway crest that would vary between elevations 217 and 230, or reduction to natural river level elevation 165. Both alternatives were proposed by NMFS. These two alternatives were then expanded to consider each alternative with 500,000 acre-feet of flood storage and without such storage. Flood storage and hydropower are the current approved authorizations for the John Day project.

Section 3. Description of the Study Area

The Columbia River originates in Canada and flows for 300 miles through eastern Washington to Oregon and continues west to the Pacific Ocean, as shown in Figure 1. The adjoining region is mostly open country, with widely scattered population centers. The climate of the region is semiarid. Agriculture, open space, and large farms are prevalent. Lands adjacent to the reservoir are used to grow grains and other crops. The reach of the Columbia River under consideration in this report extends from John Day Lock and Dam at river mile (RM) 215.6, to McNary Lock and Dam RM 291. The body of water impounded by John Day Dam, Lake Umatilla, is referred to as the John Day Reservoir throughout this report. The John Day is the second longest reservoir on the Columbia River, extending 76 miles upstream to McNary Dam.

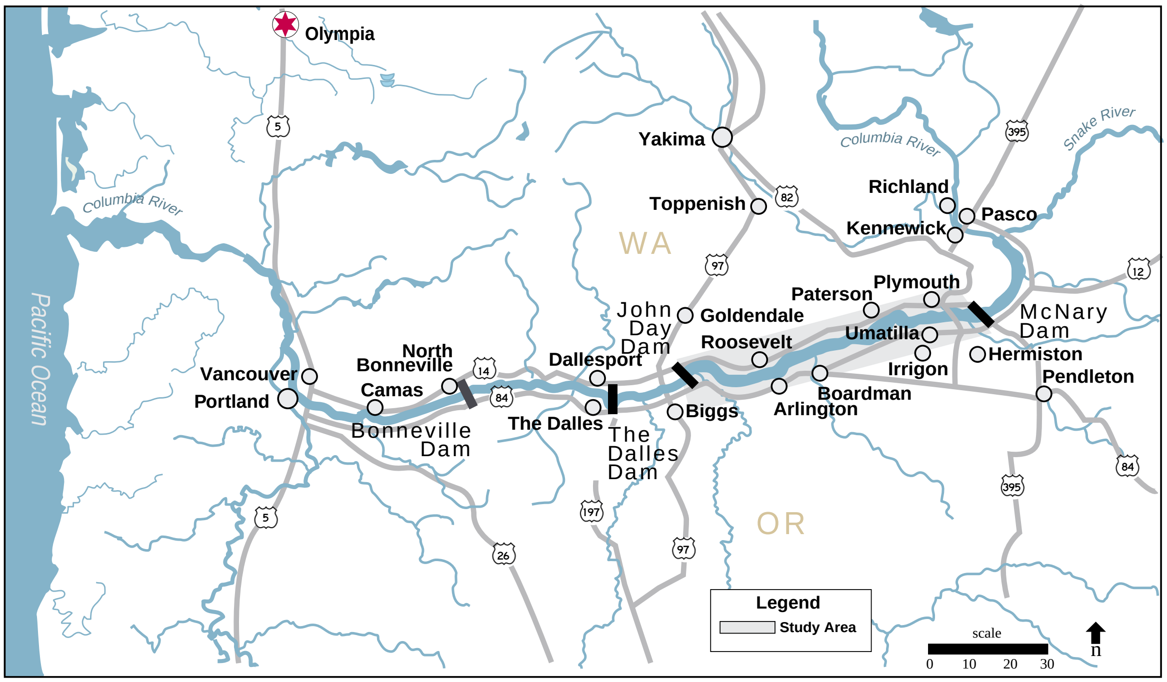


Figure 1. John Day Drawdown Phase 1 Study Area

John Day Dam and Reservoir are part of the Columbia-Snake Inland Waterway. This shallow-draft navigation channel extends 465 miles from the Pacific Ocean at the mouth of the Columbia River to Lewiston, Idaho. The entire channel consists of three segments. The first is the 40-foot-deep water channel for ocean-going vessels that extends for 106 miles from the ocean to Vancouver, Washington. The second is a shallow-draft barge channel that extends from Vancouver to The Dalles, Oregon. Although this section is authorized for dredging to a depth of 27 feet, it is currently maintained at 17 feet. The third section of the channel is authorized and maintained at a depth of 14 feet and extends from The Dalles to Lewiston. In addition to the main navigation channel, channels are dredged to numerous ports and harbors along the river.

The middle Columbia River area is served by a well-developed regional transportation system consisting of highways, railroads, and navigation channels. Railroads and highways parallel the northern and southern shores of the reservoir. Interstate 84 (I-84), a divided multilane highway, runs parallel on the south shore with the Columbia River from Portland, Oregon, to points east. Washington State Route 14 (SR-14) also parallels the Columbia River from Vancouver to McNary Dam on the north shore. Umatilla Bridge at RM 290.5, downstream from McNary Dam, is the only highway bridge linking Oregon and Washington across the Columbia River in the John Day Reservoir.

The study area includes lands directly adjacent to the reservoir as well as those directly and indirectly influenced by the hydrology of the reservoir (e.g., irrigated lands). It includes the reservoir behind the John Day Dam, and adjoining backwaters, embayments, pools, and rivers.

Section 4. Alternatives

The Phase 1 Study includes a preliminary evaluation of the impacts of the drawdown scenarios relative to the "without project condition," which is defined as the condition that would prevail into the future in the absence of any new federal action at John Day. The four alternatives are summarized below. One of the most important constraints on the alternatives is the requirement to pass fish for river flows up to the 10-year flood flow of 515,000 cfs. Under the four alternatives, John Day Reservoir would be drawn down at a rate of one foot per day. For greater detail, please refer to the main report, *John Day Drawdown Phase 1 Study*, and *John Day Drawdown Phase 1 Study, Engineering Technical Appendix, Structural Alternatives Section*.

4.1. Spillway Drawdown without Flood Control (Alternative 1)

The first drawdown alternative is based on requirements for improved downstream fish passage conditions during both low and flood flow conditions on the Columbia River. The existing 20-bay spillway will be operated differently from current operations, but without any structural modifications. All project inflows will be directly passed through the dam spillway with the spillway gates fully opened in free overflow condition, resulting in a pool elevation that will vary from elevation 217 to 230. Impacts downstream from John Day Dam were not studied.

4.2. Spillway Drawdown with Flood Control (Alternative 2)

The second study alternative is based on requirements for improved downstream fish passage conditions during low flow periods, while maintaining authorized flood control for the John Day Project. The existing 20-bay spillway will be operated differently from current operations, but without any structural modifications. During low flow periods, project inflows will be directly passed through the dam spillway with the spillway gates set in fully open, free overflow condition. During a flood event, however, the spillway gates will be controlled to reduce downstream flood flows based on using 500,000 acre-feet of allocated project storage space. Ponding will occur upstream from the dam. Impacts downstream from John Day Dam were not studied.

4.3. Natural River Drawdown without Flood Control (Alternative 3)

The third study alternative is based on a natural river drawdown for fish passage “without flood control” condition. Natural river conditions pertain to an opening at the John Day Dam that permits acceptable upstream fish passage conditions. The size of the total dam opening must conform to two criteria based on an invert elevation at the dam of 135. The first criterion is that the opening must be sufficiently large to meet maximum allowable stream velocity criteria for sustained swim speed for the weakest salmon species, which is estimated to be 10 feet per second (fps). The second criterion is that fish passage for this opening must correspond to the 10-year annual flood peak (515,000 cfs). This alternative will require extensive modifications to John Day Dam even beyond modification of the 1,228-foot long spillway structure. Impacts downstream from John Day Dam were not studied.

4.4. Natural River Drawdown with Flood Control (Alternative 4)

This fourth study alternative is based on natural river conditions for fish passage and includes the “with flood control” condition. It requires natural fish passage conditions for both upstream and downstream directions at the dam and includes a requirement for full authorized flood control. The calculated width of the total dam opening will correspond to that previously calculated for natural river conditions without flood control (Alternative 3). Impacts downstream from John Day Dam were not studied.

Section 5. Municipal Water Supplies

5.1. Water Supply Facility Recovery Alternatives

Under each of the alternatives above, the effect on the water supplies for the cities, towns, agencies, and private owners will be due to three factors: location, distance, and quality. Current water supplies will be primarily affected by the location of the existing intake or well screen elevations relative to the new reservoir pool operating elevations. The second factor is the distance of the water supply from the pool. The third factor is the water quality of any required substitute sources of water. Currently, intakes are established either in the surface water of the reservoir; in the alluvial aquifer; in the basalt aquifer; or are located in both aquifers. Water supplies that may be affected in the pool area are shown on Plates 1 through 6 and noted on Table 1.

The measure of effectiveness for existing water supply systems in the drawdown scenarios will be whether the existing systems can be augmented or supplemented to provide current volume and quality of water.

The states of Oregon and Washington may restrict new water rights or water usage for the region if the quantity of water becomes too limited or reduced by drawdown levels. The water right quantity (or yield) for each current user may then depend on the available total flow for all water users. Total flow for all uses must be considered if there will be limited available water.

Replacement options for the main water supply involve either installing new intakes in the reservoir, or replacing or deepening wells. For the new intakes option, drawdown would need to take place first, and then construction could begin. This may require some excavation to install intakes in the reservoir's new shoreline location and to construct land extensions to place the pipelines and intakes. Replacement wells of smaller capacity but greater in number could replace some of the existing supplies without interruption; deepening wells would cause interruption. New river intakes for larger users would leave water supply owners and users without operating supplies until new intakes and pumps are installed. Then, new water facilities would come on line. Some reserve water or a temporary source would be required for a period of time. Where canals may be used, scheduling for canal construction prior to drawdown would prevent loss of water during drawdown and provide a source of water prior to operating at new pool levels.

Table 1. Municipal Water Supplies

Identification Number[g]	Current Well Owner	Common Well Name or Designation	State	Aquifer	Ground Surface Elevation (ft)	Elevation Top Open Interval (ft	Elevation Bottom Open Interval (ft)	Elevation, Static Water Level (SWL)	Elevation Bottom of Well (ft)	Water Right (gpm)	Target Yield (gpm)
See Note[f]	City of Boardman	Ranney Collector (# 1)[a]	OR	Aluv	272	230	230	264	223.5	6030[b]	6000
See Note[f]	City of Boardman	Ranney Collector (# 2)[c]	OR	Aluv	272	--	--	--	--	--	--
1	USACE	LaPage Park Well	OR	Aluv	280	137	122	268	122	67	67
3	USACE	Albert Philippi Park Well	OR	Bslt	290	184	17	258	17	148	148
5	City of Arlington	Main City Well	OR	Bslt	291	227	-328	250	-328	987	600
7	City of Arlington	Arlington Park Well[d]	OR	Bslt	290	239	40	258	40	13.5	155
11	WA Dept Parks and Rec	Crow Bte St Pk Dom Well	WA	--	300	--	--	--	210	40	40
12	Port of Morrow	Redi-Mix Well	OR	Bslt	297	196	62	249	62	--	--
18	Boardman Park Dist	New Irrigation Well	OR	Aluv	272	242	222	264	222	85	85
47	Columbia Jr. H.Schl.	--	OR	Aluv	290	230	230	257	230	58	58
48	USAGE	Marina Park Well # 1	WA	Aluv	280	235	220	268	220	36	36
49	City of Irrigon	Well # 1 (Shallow)	OR	Aluv	300	247	234	268	232	121	900
2156	City of Boardman	Boardman Backup Well	OR	Bslt	300	-254	-285	238	-285	--	--
2158	USAGE	Plymouth Park Campground	WA	Bslt	280	216	52	190	52	--	--
2163	USAGE/Plymouth	Backup Well	WA	Bslt	290	-275	-339	290	-339	--	--
2167	Port of Morrow	Frederickson, Oregon Hay	OR	Aluv	320	246	240	269	235	Exempt	50
CH2M-1	Port of Morrow	Carlson Sump # 1	OR	Aluv	271	242	242	265	242	507	507
CH2M-2	Port of Morrow	Carlson Sump # 2	OR	Aluv	270	245	245	265	245	507	507
CH2M-3	Port of Morrow	Carlson Pmp St Sump#3	OR	Aluv	274	247	247	265	247	2334	2334
46	US Fish & Wildlife	Umatilla NWR Shop Well	OR	Aluv	285	208	208	259	208	N/A	60
CH2M-10	Umatilla NWR/McCrm U	Domestic # 1	OR	Aluv	280	--	--	--	--	--	40
CH2M-11	Umatilla NWR/McCrm U	Domestic # 2	OR	Aluv	270	--	--	--	--	--	40
CH2M-12	Umatilla NWR/Whtcm U	Domestic # 3	OR	Aluv	300	--	--	--	--	--	40

CH2M-6	Umatilla NWR/McCrm U	Well # 1	OR	Aluv	280	--	--	--	220	1973	1973
CH2M-7	Umatilla NWR/McCrm U	Well # 2	OR	Aluv	281	--	--	265	221	1211	1211
CH2M-8	Umatilla NWR/McCrm U	Well # 3 (Well A)	OR	Aluv	279	--	--	265	224	807	807
CH2M-9	Umatilla NWR/McCrm U	Well # 4 (Well B)	OR	Aluv	280	236	213	250	204	879	879
	City of Umatilla	Ranney Well Collector	OR	Aluv	--	--	--	--	--	--	--
	City of Hermiston	Reservoir Intake	OR	--	--	--	--	--	--	--	--
	Irrigon Fish Hatchery	Ranney Well Collector 1	OR	Aluv	272	272	192	240	200	8800 [e]	8800
	Irrigon Fish Hatchery	Ranney Well Collector 2	OR	Aluv	279	279	191	230	210	16000 [e]	16000
	Irrigon Fish Hatchery	Well 1	OR	Aluv	276	242	193	226	206	2800 [e]	2800
	Irrigon Fish Hatchery	Well 2	OR	Aluv	283	243	215	265	200	3500 [e]	3500
	Irrigon Fish Hatchery	Well 3	OR	Aluv	283	248	208	261	199	2000 [e]	2000
	Umatilla Fish Hatchery	Ranney Well Collector	OR	Aluv	280	280	211	230	207	15000 [e]	15000
	Umatilla Fish Hatchery	Well 1	OR	Aluv	284	249	214	257	201	400 [e]	400
	Umatilla Fish Hatchery	Well 2	OR	Aluv	286	242	212	266	209	1800 [e]	1800
	Umatilla Fish Hatchery	Well 3	OR	Aluv	286	243	223	266	216	1000 [e]	1000
	Umatilla Fish Hatchery	Well4	OR	Aluv	285	253	223	266	216	2250 [e]	2250
CH2M-15	City of Hermiston	New Well # 2	OR	--	--	--	--	--	--	--	--

[a] Ranney Collector System Well for the City of Boardman drinking water. In operation since 1976. Will require complete replacement under spillway or natural drawdown conditions.

[b] Design yield. Ref: John Day Pool Drawdown/Water Supply Mitigation Study Publicly Owned Wells, prepared by CH2M Hill for USAGE, dated November 1995.

[c] Second Ranney System Well to be constructed in 1999.

[d] Backup well for city water. Pump capacity selected as target yield.

[e] Water rights not known. Default to existing pump capacity.

[f] No number assigned.

[g] Internal Identification number from past studies.

(--) Indicates information not available.

5.2. Current Users and Water Supplies

The number of municipal water supply users with the potential for affecting the water supplies is approximately 15, having a total capacity of approximately 77,500 gallons per minute (as determined from previous water supply studies). These studies did not include every well or water supply in the affected area; they covered municipal users with defined water supply systems (summarized in Table 1). The actual effect on water supplies from the drawdown will vary by distance and by whether the pool is the direct or the secondary source for the aquifer recharge

A preliminary assessment of the impacts on current water wells and intakes was made for the two alternative drawdown elevations. Water supplies potentially affected at Spillway Crest and Natural River drawdown pool elevations are shown on Table 2; likely impacts are rated for both pool elevations. The highest potential impacts for water supplies will be where the water-bearing zone and current well intakes located within the alluvial aquifer become non-functional. The drawdown of the pool in either alternative will first affect the alluvial aquifer, which is the higher aquifer in the pool area and is directly recharged by the reservoir. Drawdown will also likely affect the recharge of the basalt aquifer at the lower Natural River drawdown elevations and to a lesser extent at Spillway drawdown elevations. Impacts on other water supplies were discussed in the references for Minimum Operating Pool drawdown listed at end of this appendix.

All surface water intakes located above the alternative drawdown pool elevation levels will be totally impacted. There will be major impacts on shallow wells in the alluvial aquifer where the pool elevation leaves little or no water above the well’s intake zone. There will be no recharge of the alluvial aquifer above this elevation, which would leave the wells essentially unusable. All Ranney wells in the pool will also be affected through lower effective head in the intake lateral lines, leading to insufficient head for proper operation, greatly decreased inflows, and subsequent high inflow of sands and silts into the system. This would lead to progressive shut down of the Ranney wells.

5.3. Canal Recovery Alternative

If a canal option is chosen as a feasible and economical alternative for the irrigation pump stations modifications, then the water capacity of the canals could also supply current water users if all affected users can draw from the canals. At this time, no additional cost to increase the size of the irrigation canals is required. However, the increased costs associated with this option may be beyond that which the owners may be able or willing to pay to regain lost water capacity. The users would need to locate pumps at the canal and run pipeline to their existing water supply or distribution lines, and provide for treatment of the water. Other issues may include acquisition of property for canal or pipeline supply alignments; access right-of-ways; easements for secondary canals, pipelines, and electrical lines; and siting of pumps or booster pumps. High capital costs and future operation and maintenance (O&M) costs for providing water based on engineering feasibility must be weighed against loss of income, profit and profit margins, and future impacts from the Endangered Species Act (which may lead to removal of incentives for remaining in the region). Relocation of towns

Table 2. Impacts to Municipal Water Supplies.

Identification Number (a)	Current Well Owner	Common Well Name or Designation	State	River Elevation - Spillway	River Elevation - Natural River	Impact Potential at Spillway Elevation	Impact Potential at Natural River Elevation	Drawdown Effects on Well Under Spillway and Natural	Impact	Potential Recovery Alternatives [c]
See Note 6	City of Boardman	Ranney Collector (# 1) [a]	OR	223	223	High	High	Lowering of SWL	System inoperable	Combined river intake, pumps, pipeline, water treatment
See Note 6	City of Boardman	Ranney Collector (# 2) [b]	OR	223	223	High	High	Lowering of SWL	System inoperable	Combined river intake, pumps, pipeline, water treatment
1	USAGE	LaPage Park Well	OR	218	161	Mod	Mod	Lowering of SWL	Loss of Head/gpm	Resize/adjust pump/intake or replace well.
3	USAGE	Albert Philippi Park Well	OR	218	162	Mod	Mod	Lowering of SWL	Loss of Head/gpm	Resize/adjust pump/intake.
5 and 7	City of Arlington	Both Wells	OR	218	185	Mod	Mod	Lowering of SWL	Loss of Head/gpm	Resize/adjust pump/intake.
11	Washington Dept. of Parks and Recreation	Crow Butte State Park Domestic Well	WA	228	218	Mod	Mod	Lowering of SWL	Loss of Head/gpm	Drill additional depth/adjust pump/intake.
12	Port of Morrow	Redi-Mix Well	OR	224	224	Mod	Mod	Lowering of SWL	Loss of Head/gpm	Drill additional depth/adjust pump/intake or replace well.
18	Boardman Park District	New Irrigation Well	OR	223	222	High	High	Lowering of SWL	Loss of Head/gpm	Drill additional depth/adjust pump/intake or replace well.
47	Columbia Jr. High School	--	OR	232	232	High	High	Lowering of SWL	Loss of Head/gpm	Drill additional depth/adjust pump/intake or replace well.
48	USAGE	Marina Park Well # 1	WA	232	232	High	High	Lowering of SWL	Loss of Head/gpm	Drill additional depth/adjust pump/intake or replace well.
49	City of Irrigon	Well # 1 (Shallow)	OR	233	233	High	High	Lowering of SWL	Loss of Head/gpm	Drill additional depth/adjust pump/intake or replace well.

2156	City of Boardman	Boardman Backup Well	OR	222	222	Low	Low	Lowering of SWL	Loss of Head/gpm	Drill additional depth/adjust pump/intake or replace well.
2158	USAGE	Plymouth Park Campground	WA	245	245	Mod	Mod	Lowering of SWL	Loss of Head/gpm	Drill additional depth/adjust pump/intake or replace well.
2163	USAGE /Plymouth	Backup Well	WA	250	250	Low	Low	Possible decr. in SWL.	Loss of Head/gpm	Drill additional depth/adjust pump/intake or replace well.
2167	Port of Morrow	Frederickson, Oregon Hay	OR	222	222	High	High	Lowering of SWL	Loss of Head/gpm	Drill additional depth/adjust pump/intake or replace well.
CH2M 1-3	Port of Morrow	Carlson Sump #1 ,2, and 3	OR	223	223	High	High	Lowering of SWL	Loss of Head/gpm	Combined river intake, pumps, pipeline, water treatment
46	US Fish & Wildlife	Umatilla NWR Shop Well	OR	232	232	High	High	Lowering of SWL	Loss of Head/gpm	Drill additional depth/adjust pump/intake or replace well.
CH2M-10,11	Umatilla NWR/McCrm U	Domestic # 1 and # 2	OR	228	228	High	High	Lowering of SWL	Loss of Head/gpm	Combined river intake, pumps, pipeline, water treatment
CH2M-12	Umatilla NWR/Whtcm U	Domestic # 3	OR	220	215	High	High	Lowering of SWL	Loss of Head/gpm	Combined river intake, pumps, pipeline, water treatment
CH2M-6,7,8,9	Umatilla NWR/McCrm U	Well # 1,2,3, and 4	OR	223	223	High	High	Lowering of SWL	Loss of Head/gpm	Combined river intake, pumps, pipeline, water treatment
	City of Umatilla	Ranney Well Collector	OR	250	250	Mod?	Mod?	Lowering of SWL	Loss of Head/GPM	
	City of Hermiston	Reservoir Intake	OR	250	250	Mod?	Mod?	Lowering of SWL	System inoperable	
	Irrigon Fish Hatchery	All Wells	OR	232	232	High	High	Lowering of SWL	System inoperable	Combined river intake, pumps, pipeline, water treatment
CH2M-15	City of Hermiston	New Well # 2	OR	--	--	Mod/Low	Mod/Low	Possible lowering of SWL.	Loss of Head/GPM	Well info unknown. May be located near Hermiston.

[a] Ranney Collector System Well for the City of Boardman drinking water, in operation since 1976.

[b] Second Ranney System Well to be constructed in 1999.

[c] Combined river intake water supplies are grouped together

(--) Indicates information not available.

or facilities may then become cost effective, rather than constructing alternative water supplies.

Table 3 and Table 4 list the primary and alternative options, respectively, and associated requirements, costs, and feasibility.

Table 3. Primary Options: New Intakes and Replacement, and Deepening Wells	
New water intakes in pool	
Items required	• Install new pumps and pipelines, or construct access benches into the pool and install intakes, pumps, and pipeline • Treatment facilities for bacteria, chemicals, and minerals • Install new distribution system if required • Heating and cooling of treated water (for fish hatcheries) • New holding tanks or holding ponds • Additional lands
Costs include	• Capital investment for land acquisition, intakes, turbine pumps, treatment plant, heating and cooling systems, holding tanks. • Future costs include additional electricity payments, maintenance of new pumps and intakes and treatment facility, cleaning of holding tanks or ponds.
Feasibility	Most likely alternative for users with high water quantities.
Replacement of wells or siting of well intakes at lower elevation in existing well	
Items Required	Drill, develop well, install well screen, and install new pump.
Costs include	Capital costs for drilling and developing new wells, for drilling existing wells deeper, for installing new pumps, or for modifying existing pump.
Feasibility	Most likely alternative for small to moderate users.
Deepening of existing wells	
Items required	• Remove existing pump or well column • Drill to deeper interval for water production • Install well screen • Develop well • Install new pump or well column
Costs include	• Costs for drilling to deeper elevations, installing and developing wells, new pumps or extended pump columns, and any electrical control changes • Future costs include additional electricity payments
Feasibility	Only likely for small users who can use alternative water supplies until deeper wells are completed

Table 4. Alternative Options: Canal, Import, Combined Sources, and Buyout	
Intakes from proposed water canal and associated treatment	
Items required	• Land or property for siting pipelines and treatment facility • Install booster pumps, distribution pumps, and pipelines • Treatment of pool water for bacteria, chemicals, and minerals • Install new distribution system if required • Heating and cooling of treated water as applicable • New holding tanks or holding ponds
Costs include	• Capital investment for the canal for lands (partial or graduated portion of canal), intakes, pumps, treatment plant, distribution system, heating and cooling systems, holding tanks. • Future costs include additional electricity payments, maintenance of new pumps and intakes and treatment facility, and cleaning of holding tanks or ponds.
Feasibility	Only likely if the canals are chosen for the irrigation pump stations, but alternative is more costly than other alternatives due to land acquisition for pipelines to the canal location from the existing user location.
Importation of water from other municipal entities	
Items required	• Lands and property • Pipeline • Treatment as required • Truck, rail, or barge transportation • New holding tanks or holding ponds
Costs include	• Capital investment for the treatment plant, distribution system, heating and cooling systems, holding tanks or ponds, lands, easements, and right-of-ways. • Future costs include additional electricity payments, maintenance of new pumps and pipeline, and treatment facility, cleaning of holding tanks or ponds.
Feasibility	For small users, this may be cost effective but the dependence on others would not likely make this a favorable choice to users.
New combined water source (other than wells or pumps) and distribution (must be combined with canal or other water transport source)	
Items required	• Lands and right-of-ways • New reservoir (away from pool area) • Treatment system • Distribution system and pipelines • New holding tanks or holding ponds
Costs include	• Capital investment for land required for reservoir area, treatment system and plant, distribution system, holding tanks or ponds. • Future costs include additional electricity payments, maintenance of new pumps and pipeline, and treatment facility.
Feasibility	Not likely due to land acquisition costs and dependence on using Canals.
No action. Let owners seek individual solutions.	
Items required	No action by Government, advisory capacity only.
Feasibility	Possible
Buy-out of landowners and cities	
Items required	Authority required to relocate or buy-out owners.
Feasibility	Action required by Congress for authority for this alternative.

Detailed recovery options would be evaluated for each site and user to determine feasibility of solutions in Phase 2 of the study. At this time, the O&M component (eight percent per year of the initial capital cost) should be used for the estimated O&M cost. Requirements of individual owners would need to be determined whether any of the options would be acceptable or are viable. Table 2 contains some potential solutions for the specific water supply systems. Using the most likely alternatives, either replacement of wells or deepening wells and combining different water supplies of individual owners into one river intake (groups shown in Table 2) the estimated costs are approximately $60 million.

Section 6. Private Wells

6.1. Current Users and Water Supply

Under any of the alternative drawdown options, the effect on the water supplies for individual owners (domestic users) will vary due to the new operational reservoir levels and the distance the well is located from the reservoir. The owners' current water supply will be impacted by location of the well intake or well screen elevation in the alluvial or basalt aquifer.

From previous studies in the pool area, details of water users with wells and water rights based on Oregon and Washington state records were included in the report, "Lake Umatilla Well Inventory Study" August 1995 (Revised), prepared for USACE by Geotechnical Resources, Inc.

Approximately 300 alluvial wells used primarily for domestic water are located adjacent to the pool. These wells have their well screens located in the alluvial aquifer that is recharged directly by the pool. Approximately 320 other shallow wells are located away from the pool and are not expected to be affected by reservoir drawdown levels. Approximately 200 small domestic water wells drilled into the basalt aquifer are located close to the pool area. Of these, 200 wells with their well screens located in both aquifers may be partially affected because reservoir water recharges the basalt aquifer also. In addition, approximately 1,200 small domestic wells are located further away from the reservoir area, with their well screens in the basalt aquifer; these wells are not directly influenced by fluctuations in the reservoir levels. In summary, an estimated 400 wells may be directly or partially affected by reservoir drawdown.

6.2. Water Supply Alternatives

For shallow well owners, one alternative is to drill a deeper well to place the well screen in the horizon below where the reservoir level will be operating. A drop of approximately 40 feet in pool height would adversely affect any shallow well. Deeper wells above the basalt aquifer are one option to mitigate the drop in reservoir level.

Water use from the basalt aquifer in Oregon in the Boardman-Umatilla-Hermiston region is regulated by the Oregon Water Resources Department (OWRD). Over-use of the aquifer caused the OWRD to halt additional drilling and withdrawal from the aquifer. Therefore, deeper wells into the basalt aquifer are not an option for those with shallow wells seeking to use the basalt aquifer as an alternative source.

A measure of effectiveness of the existing water supply system in the drawdown scenarios will be whether the alternative will supply the current quantity and quality of water at the proposed pool levels.

Table 5 presents the options for recovering water supply capacity.

Table 5. Options for Recovering Water Supply Capacity

Construct new water well	
Items required	Drill one well to deeper elevation than original well. Install new well screens, develop the well, pump test the well, reinstall pump and controls, or replace if required due to greater depth.
Costs include	• Capital investment for new well or deepened well, casing, well screens, and new pump • Future costs include additional electricity payments.
Feasibility	Most likely alternative for domestic users.
Purchase water from municipality or commercial source	
Items required	Delivery system
Costs include	• Capital investment for new pipeline. • Future costs include increased water costs.
Feasibility	Higher costs than constructing new water well due to potentially higher unit cost of water.
No action. Let owners seek individual solutions.	
Items required	No action by government, advisory capacity.
Feasibility	Likely government action.
Buy-out of landowners	
Items required	Authority required to relocate or buy-out owners.
Feasibility	• Need Congressional action and authority for this alternative. • Individual owners' requirements would be required to determine whether solutions are economical or viable. Generic solutions for private wells are included in Table 4

Section 7. Summary

Owners of water supplies may have to choose among limited recovery methods. The economics of the choices may determine which choice may be viable. Main recovery choices for system replacement are shown in the Table 6 below.

Table 6. Summary Table

Existing System	**Alternative 1 Replacement**	**Alternative 2 Replacement**	**Alternative 3 Replacement**	**Alternative 4 Replacement**
Ranney Well Collector	New Pumps and Intake, or Canals	Canals Or new pumps and intakes	New Pumps and Intakes, or Canals	Canals Or new pumps and intakes
Large Alluvial Well	New Pumps and Intake or Canals	Canals Or new pumps and intakes	New Pumps and Intakes, or Canals	Canals Or new pumps and intakes
Basalt/Alluvial Well	Adjust, lower intake screens, or adjust pump	Adjust, lower intake screens, or adjust pump	Adjust, lower intake screens, or adjust pump	Adjust, lower intake screens, or adjust pump
Basalt Well	Adjust or Resize Pump	Adjust or Resize Pump	Adjust or Resize Pump	Adjust or Resize Pump
Surface Collection	New Pumps and Intake, or Canal	Canals	New Pumps and Intake, or Canal	Canals
Private Domestic Well – Alluvial	New well or Purchase water from others	New well or Purchase water from others	New well or Purchase water from others	New well or Purchase water from others
Private Domestic Well – Basalt	Adjust or Resize Pump, or new well	Adjust or Resize Pump, or new well	Adjust or Resize Pump, or new well	Adjust or Resize Pump, or new well

Section 8. References

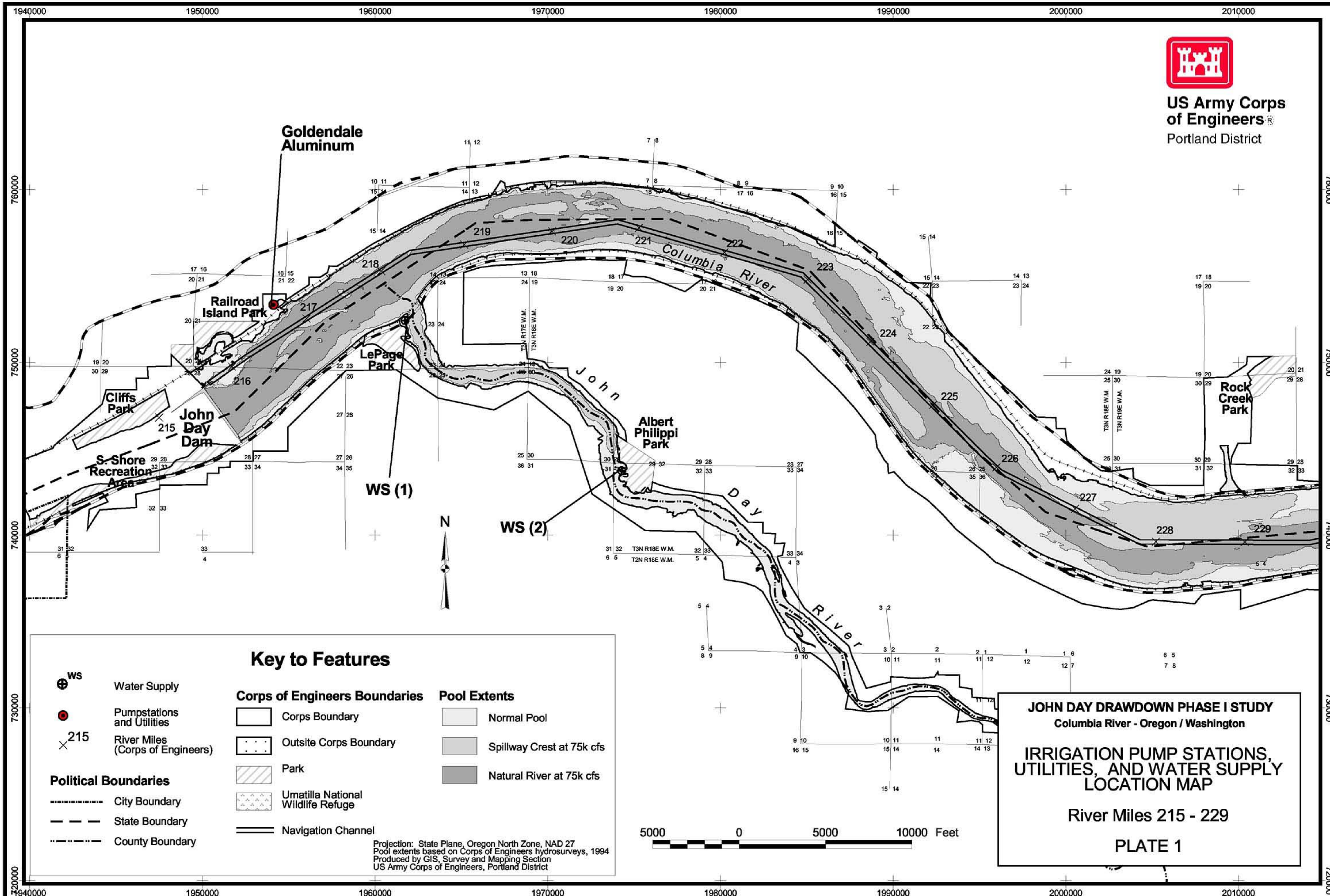
Study of Water Supplies for Irrigon and Umatilla Fish Hatcheries During John Day Reservoir Minimum Operating Pool, April 13, 1995, Prepared by Bovay Northwest, Inc., with KCM, Inc., DACW68-92-D-0008, Delivery Order No. 9

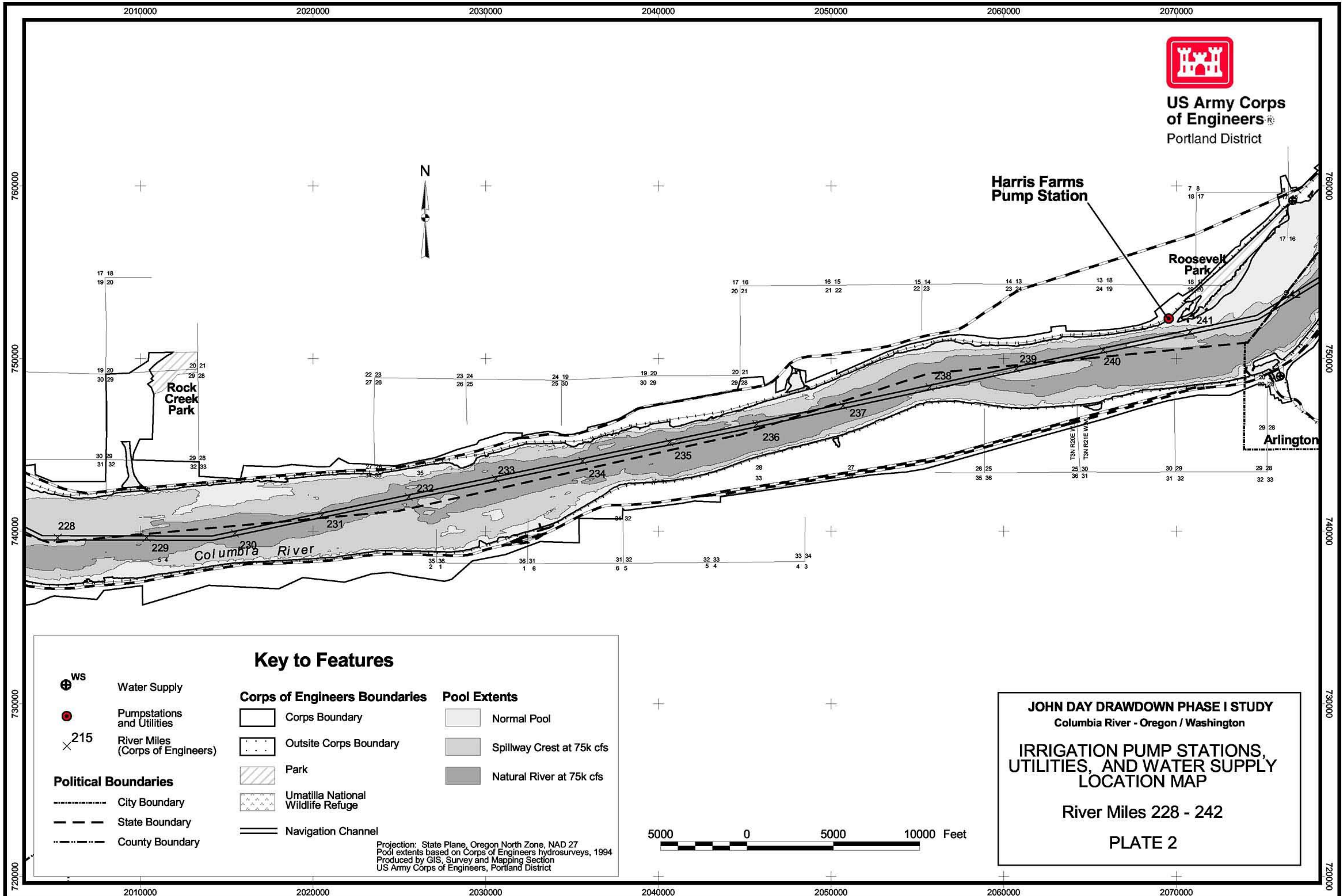
Lake Umatilla Well Inventory Study, August 1995 (Revised), Prepared by Geotechnical Resources, Inc. Contract No. DACW57-94-D-0003, Delivery Order No. 0005

John Day Pool Drawdown/Water Supply Mitigation Study Publicly Owned Wells (60 Percent Review Memorandum), November 1995, Prepared by CH2M Hill, DACW57-95-D-002/003

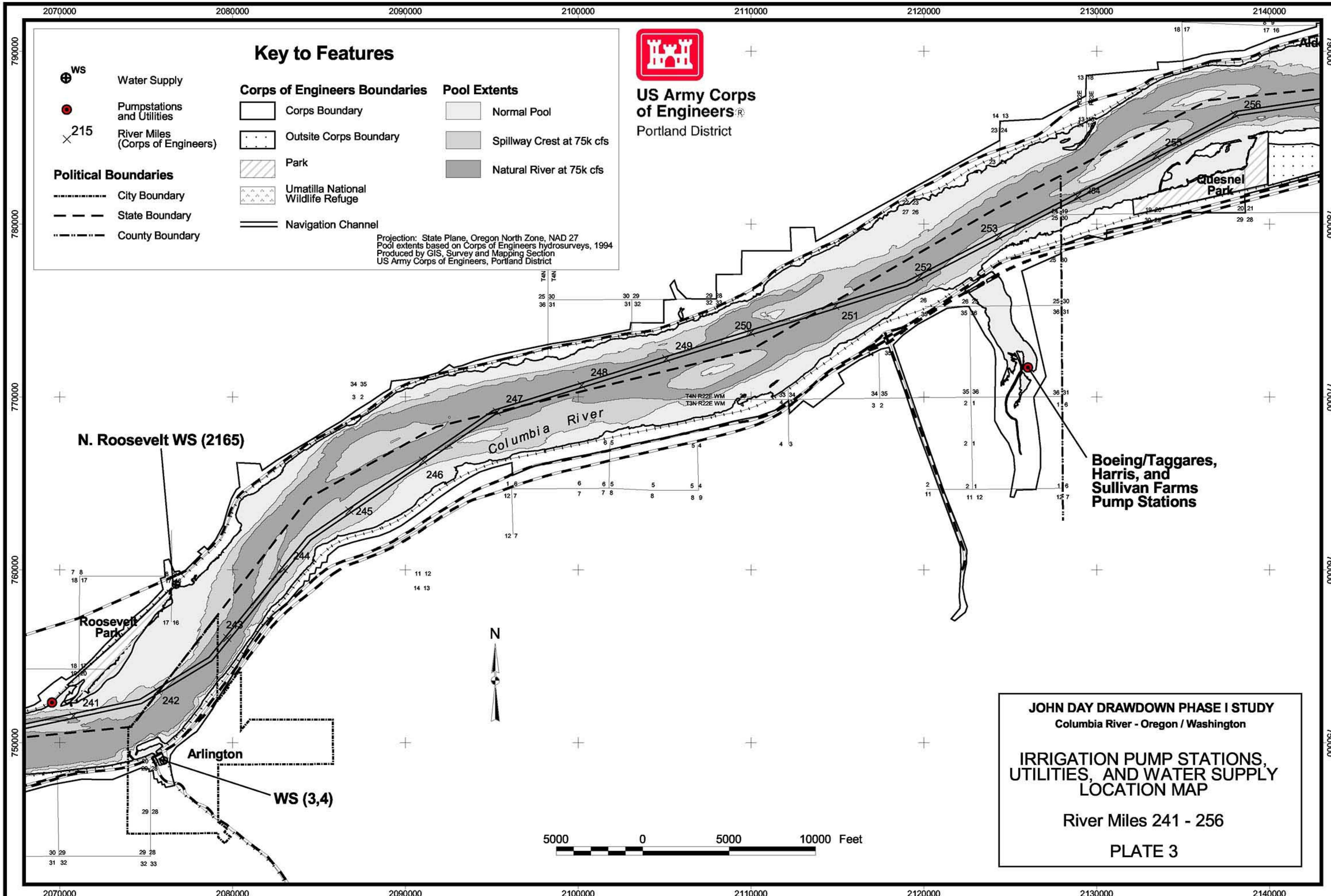
John Day Pool Drawdown/Water Supply Mitigation Study City of Boardman Ranney Collector, December 1995, Prepared by CH2M Hill, Contract No. DACW57-95-D-002/001

Plates

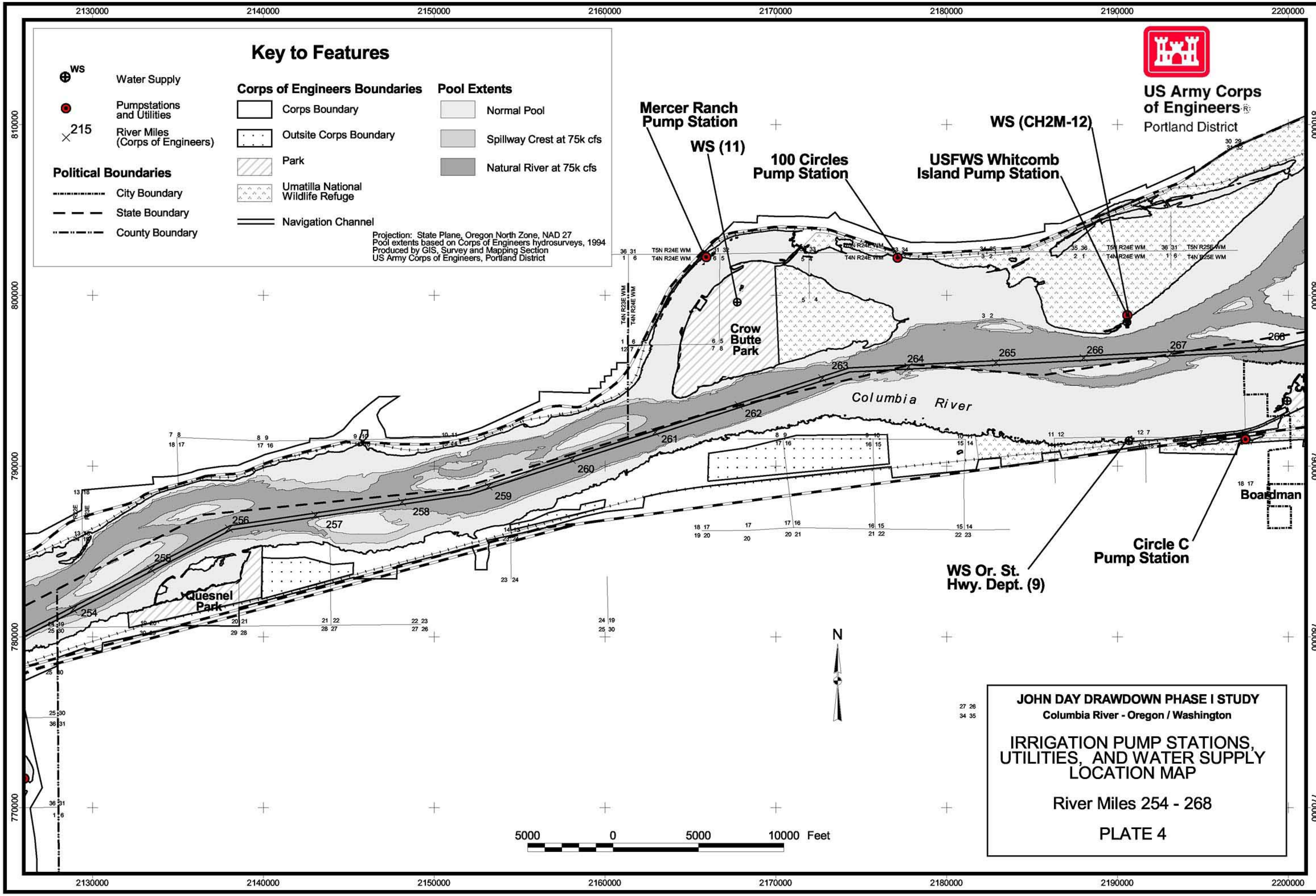

US Army Corps of Engineers
Portland District
Goldendale Aluminum
Railroad Island Park
Cliffs Park
John Day Dam
S. Shore Recreation Area
LePage Park
WS (1)
WS (2)
Albert Philippi Park
Rock Creek Park
Columbia River
John Day River
215
216
217
218
219
220
221
222
223
224
225
226
227
228
229
T3N R17E W.M.
T3N R18E W.M.
T2N R18E W.M.
T3N R19E W.M.
N
Key to Features
Water Supply
Pumpstations and Utilities
River Miles (Corps of Engineers)
Political Boundaries
City Boundary
State Boundary
County Boundary
Corps of Engineers Boundaries
Corps Boundary
Outsite Corps Boundary
Park
Umatilla National Wildlife Refuge
Navigation Channel
Pool Extents
Normal Pool
Spillway Crest at 75k cfs
Natural River at 75k cfs
Projection: State Plane, Oregon North Zone, NAD 27
Pool extents based on Corps of Engineers hydrosurveys, 1994
Produced by GIS, Survey and Mapping Section
US Army Corps of Engineers, Portland District
5000 0 5000 10000 Feet
JOHN DAY DRAWDOWN PHASE I STUDY
Columbia River - Oregon / Washington
IRRIGATION PUMP STATIONS, UTILITIES, AND WATER SUPPLY LOCATION MAP
River Miles 215 - 229
PLATE 1



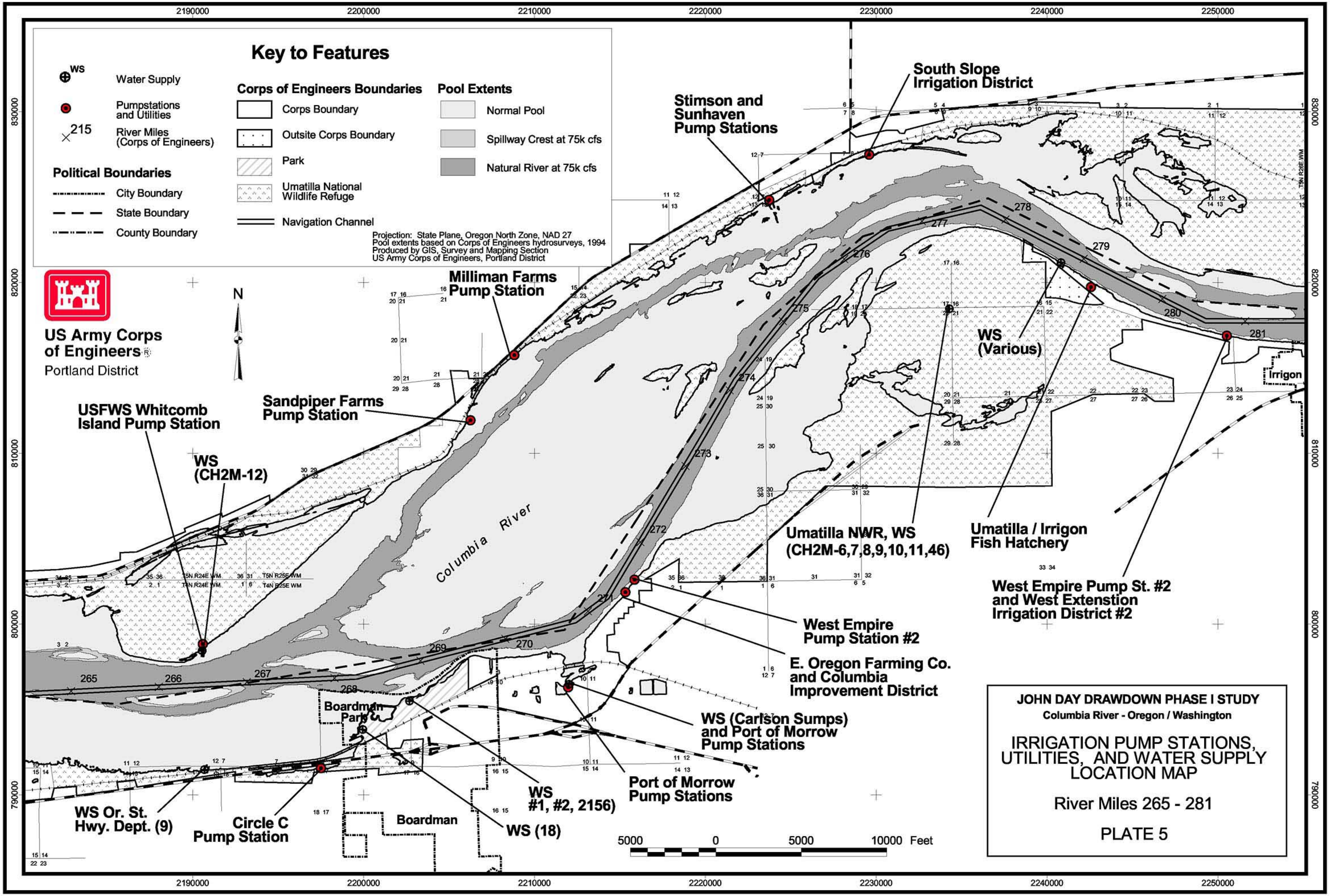
US Army Corps
of Engineers®
Portland District
N
Harris Farms
Pump Station
Roosevelt
Park
Rock
Creek
Park
Arlington
Columbia River
228
229
230
231
232
233
234
235
236
237
238
239
240
241
242
2010000
2020000
2030000
2040000
2050000
2060000
2070000
760000
750000
740000
730000
720000
T3N R20E WM
T3N R21E WM
Key to Features
WS
Water Supply
Pumpstations
and Utilities
215
River Miles
(Corps of Engineers)
Political Boundaries
City Boundary
State Boundary
County Boundary
Corps of Engineers Boundaries
Corps Boundary
Outsite Corps Boundary
Park
Umatilla National
Wildlife Refuge
Navigation Channel
Pool Extents
Normal Pool
Spillway Crest at 75k cfs
Natural River at 75k cfs
Projection: State Plane, Oregon North Zone, NAD 27
Pool extents based on Corps of Engineers hydrosurveys, 1994
Produced by GIS, Survey and Mapping Section
US Army Corps of Engineers, Portland District
5000
0
5000
10000
Feet
JOHN DAY DRAWDOWN PHASE I STUDY
Columbia River - Oregon / Washington
IRRIGATION PUMP STATIONS,
UTILITIES, AND WATER SUPPLY
LOCATION MAP
River Miles 228 - 242
PLATE 2



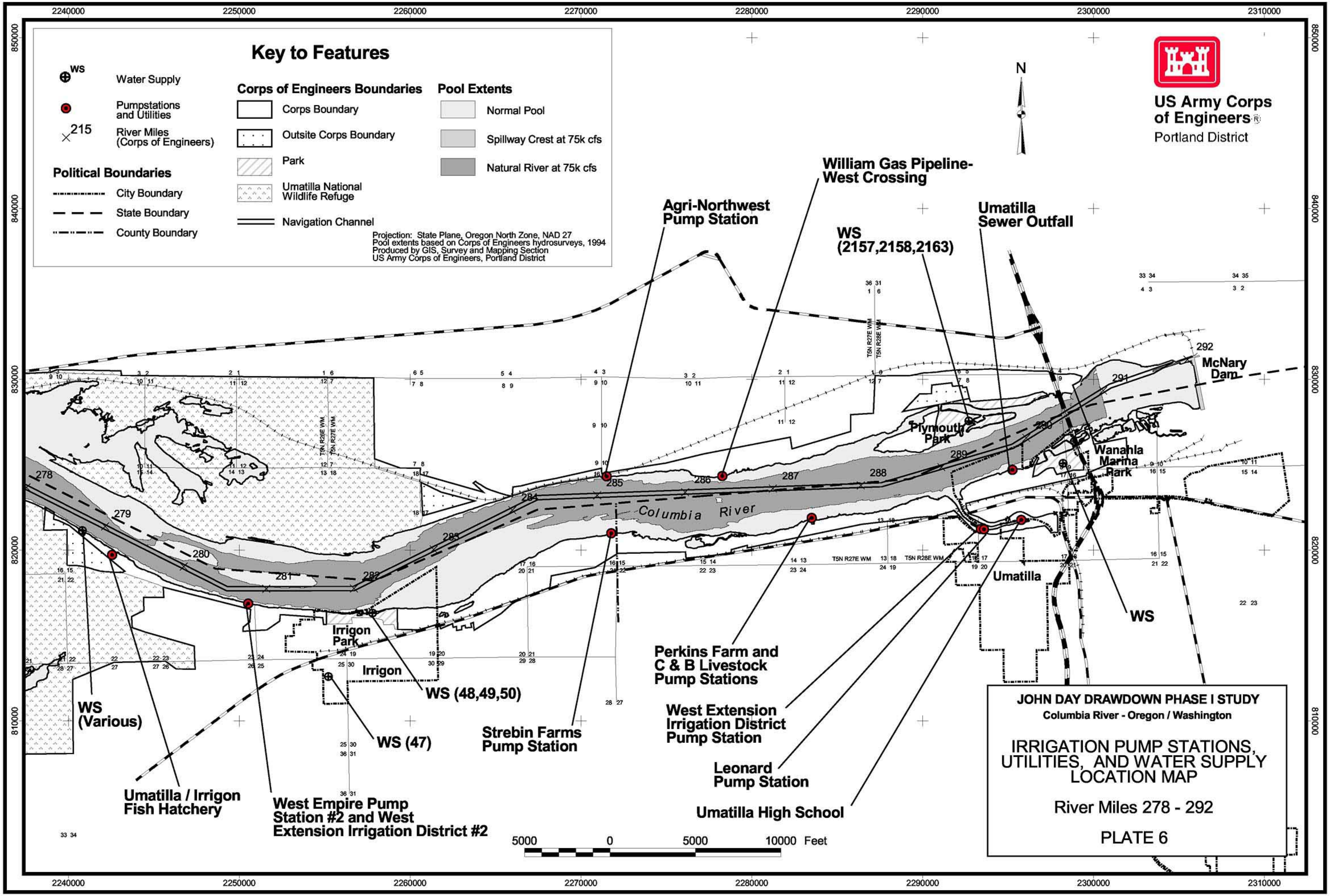
Key to Features
Water Supply
Pumpstations and Utilities
River Miles (Corps of Engineers)
Political Boundaries
City Boundary
State Boundary
County Boundary
Corps of Engineers Boundaries
Corps Boundary
Outsite Corps Boundary
Park
Umatilla National Wildlife Refuge
Navigation Channel
Pool Extents
Normal Pool
Spillway Crest at 75k cfs
Natural River at 75k cfs
Projection: State Plane, Oregon North Zone, NAD 27
Pool extents based on Corps of Engineers hydrosurveys, 1994
Produced by GIS, Survey and Mapping Section
US Army Corps of Engineers, Portland District
US Army Corps of Engineers
Portland District
N. Roosevelt WS (2165)
Roosevelt Park
Arlington
WS (3,4)
Columbia River
Quesnel Park
Boeing/Taggares, Harris, and Sullivan Farms Pump Stations
5000 0 5000 10000 Feet
JOHN DAY DRAWDOWN PHASE I STUDY
Columbia River - Oregon / Washington
IRRIGATION PUMP STATIONS, UTILITIES, AND WATER SUPPLY LOCATION MAP
River Miles 241 - 256
PLATE 3



Key to Features
WS Water Supply
Pumpstations and Utilities
215 River Miles (Corps of Engineers)
Political Boundaries
City Boundary
State Boundary
County Boundary
Corps of Engineers Boundaries
Corps Boundary
Outsite Corps Boundary
Park
Umatilla National Wildlife Refuge
Navigation Channel
Pool Extents
Normal Pool
Spillway Crest at 75k cfs
Natural River at 75k cfs
Projection: State Plane, Oregon North Zone, NAD 27
Pool extents based on Corps of Engineers hydrosurveys, 1994
Produced by GIS, Survey and Mapping Section
US Army Corps of Engineers, Portland District
US Army Corps of Engineers
Portland District
Mercer Ranch Pump Station
WS (11)
100 Circles Pump Station
USFWS Whitcomb Island Pump Station
WS (CH2M-12)
Crow Butte Park
Columbia River
Quesnel Park
Boardman
Circle C Pump Station
WS Or. St. Hwy. Dept. (9)
T5N R24E WM
T4N R24E WM
T5N R25E WM
T4N R25E WM
T4N R23E WM
254
255
256
257
258
259
260
261
262
263
264
265
266
267
268
N
5000 0 5000 10000 Feet
2130000
2140000
2150000
2160000
2170000
2180000
2190000
2200000
810000
800000
790000
780000
770000
JOHN DAY DRAWDOWN PHASE I STUDY
Columbia River - Oregon / Washington
IRRIGATION PUMP STATIONS, UTILITIES, AND WATER SUPPLY LOCATION MAP
River Miles 254 - 268
PLATE 4



Key to Features
Water Supply
Pumpstations and Utilities
River Miles (Corps of Engineers)
Political Boundaries
City Boundary
State Boundary
County Boundary
Corps of Engineers Boundaries
Corps Boundary
Outsite Corps Boundary
Park
Umatilla National Wildlife Refuge
Navigation Channel
Pool Extents
Normal Pool
Spillway Crest at 75k cfs
Natural River at 75k cfs
Projection: State Plane, Oregon North Zone, NAD 27
Pool extents based on Corps of Engineers hydrosurveys, 1994
Produced by GIS, Survey and Mapping Section
US Army Corps of Engineers, Portland District
US Army Corps of Engineers
Portland District
South Slope Irrigation District
Stimson and Sunhaven Pump Stations
Milliman Farms Pump Station
Sandpiper Farms Pump Station
USFWS Whitcomb Island Pump Station
WS (CH2M-12)
Columbia River
WS (Various)
Irrigon
Umatilla NWR, WS (CH2M-6,7,8,9,10,11,46)
Umatilla / Irrigon Fish Hatchery
West Empire Pump St. #2 and West Extenstion Irrigation District #2
West Empire Pump Station #2
E. Oregon Farming Co. and Columbia Improvement District
WS (Carlson Sumps) and Port of Morrow Pump Stations
Port of Morrow Pump Stations
Boardman Park
Boardman
WS #1, #2, 2156)
WS (18)
WS Or. St. Hwy. Dept. (9)
Circle C Pump Station
5000 0 5000 10000 Feet
JOHN DAY DRAWDOWN PHASE I STUDY
Columbia River - Oregon / Washington
IRRIGATION PUMP STATIONS, UTILITIES, AND WATER SUPPLY LOCATION MAP
River Miles 265 - 281
PLATE 5


Key to Features
WS
Water Supply
Pumpstations and Utilities
215
River Miles (Corps of Engineers)
Political Boundaries
City Boundary
State Boundary
County Boundary
Corps of Engineers Boundaries
Corps Boundary
Outsite Corps Boundary
Park
Umatilla National Wildlife Refuge
Navigation Channel
Pool Extents
Normal Pool
Spillway Crest at 75k cfs
Natural River at 75k cfs
Projection: State Plane, Oregon North Zone, NAD 27
Pool extents based on Corps of Engineers hydrosurveys, 1994
Produced by GIS, Survey and Mapping Section
US Army Corps of Engineers, Portland District
N
US Army Corps of Engineers®
Portland District
William Gas Pipeline-West Crossing
Agri-Northwest Pump Station
Umatilla Sewer Outfall
WS (2157,2158,2163)
McNary Dam
Plymouth Park
Wanahla Marina Park
Columbia River
Umatilla
WS
Irrigon Park
Irrigon
WS (48,49,50)
WS (Various)
WS (47)
Strebin Farms Pump Station
Perkins Farm and C & B Livestock Pump Stations
West Extension Irrigation District Pump Station
Leonard Pump Station
Umatilla High School
Umatilla / Irrigon Fish Hatchery
West Empire Pump Station #2 and West Extension Irrigation District #2
5000 0 5000 10000 Feet
JOHN DAY DRAWDOWN PHASE I STUDY
Columbia River - Oregon / Washington
IRRIGATION PUMP STATIONS, UTILITIES, AND WATER SUPPLY LOCATION MAP
River Miles 278 - 292
PLATE 6